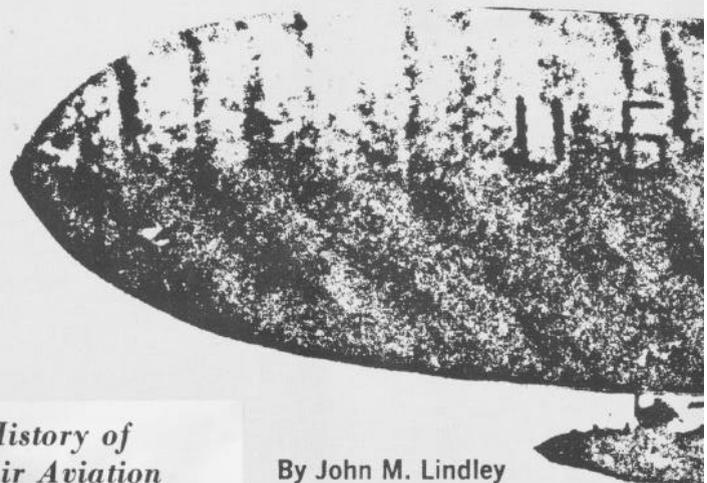


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*A History of
Sea-Air Aviation*

*Wings Over
The
Ocean
part four*

By John M. Lindley

as a catalyst for the development of airplanes, engines and flying techniques which could be utilized on a transoceanic flight.

Even before the war broke out, Lord Northcliffe, the wealthy owner of the London *Daily Mail*, put up, in April 1913, a prize of £10,000 (about \$50,000) for the "first person who crosses the Atlantic from any point in the United States, Canada, or Newfoundland to any point in Great Britain or Ireland in 72 continuous hours." When the war prevented competition for the prize, Lord Northcliffe renewed his offer in 1919, thereby setting off a flurry of flight preparation.

Yet the financial incentive of the *Daily Mail* prize had nothing to do with the flight of the U.S. Navy's NC-4 which achieved the distinction of being "first across." World War I, rather than the prize money for which the Navy flyers did not even compete, had provided the motivation for the



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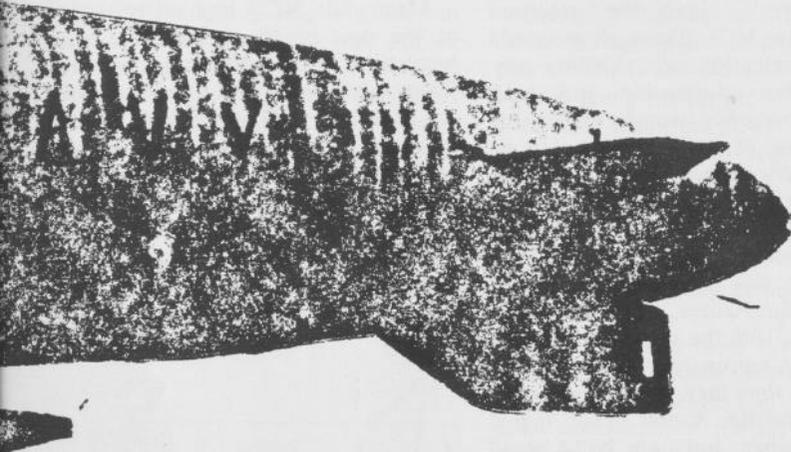
The first heavier-than-air flight over the Atlantic came 10 years after Blériot flew across the English Channel in 1909. Although Glenn Curtiss and his associates had built the flying boat *America* in 1914 with the intention of trying a transAtlantic flight, World War I intervened and caused them to abandon their plans. World War I may have delayed the conquest of the Atlantic four or five years, but it had one consequence for sea-air aviation that was far more positive: it served



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Graphic Section

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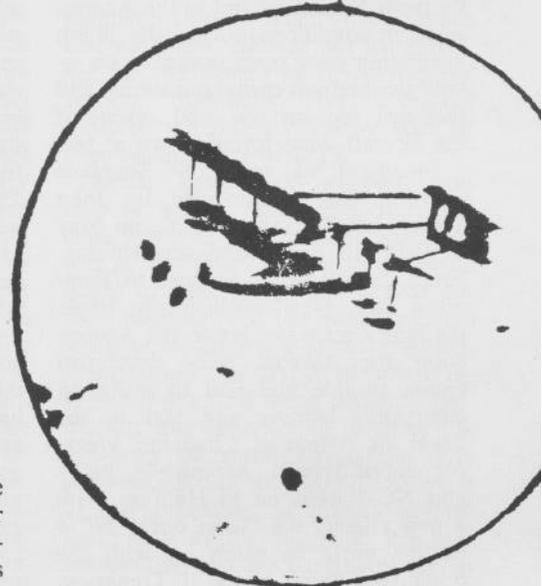
1919 flight of the NC-4.

In August 1917 Rear Admiral David W. Taylor, Chief of the Navy's Bureau of Construction and Repair, tasked his aviation staff with developing an aircraft capable of flying to Europe. Such a plane, RAdm. Taylor argued, would avoid the German submarine menace and the difficulties of shipping crated aircraft to Europe. Taylor's idea materialized about a year later in a flying boat built by the Curtiss Co. and other aircraft subcontractors. The NC flying boat, as the design was called (N for Navy, C for Curtiss), was a huge aircraft: 126-foot wingspan; 11-ton weight; 4 Liberty engines that produced a total of 1,600 horsepower. In fact, the wingspan of the NCs was only four feet shorter than the wingspan of the present-day Boeing 707.

Although the Navy and the Curtiss Company had designed and built the NC flying boat in little over a year's time, even this effort was insufficient

for getting the aircraft ready for the last weeks of the war. By October 1918, NC-1, the first of four that Curtiss would build, had made 18 flights and shown that it met design requirements. Now that the Navy had its NC flying boats, it had to use them. Commander John H. Towers, a Naval Aviator, proposed to the Chief of Naval Operations that the Navy organize a flight across the Atlantic with the NCs in the spring of 1919. Cdr. Towers stressed the national honor involved in such a pioneering flight. Secretary of the Navy Josephus Daniels agreed and in February 1919 he put Towers in charge of the flight.

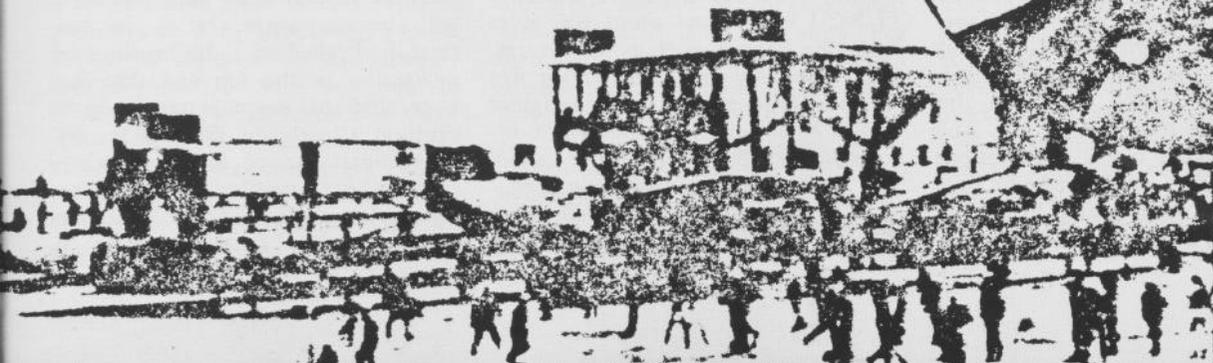
Preparations for the flight were elaborate and detailed. Under Cdr. Towers' authority, crews of six men were assigned to NC-1, -3, and -4. NC-2 had to be cannibalized for parts for the remaining three aircraft. Each plane had a commanding officer who acted as the navigator, a pilot, a copilot, a radio operator and two engi-



The NC-4 was damaged from a crash landing on the sea. The plane F-5B had trouble forced to land and was put in at Cranston, Mass. for repairs.



Lt. Comdr. S. Bellinger, the navy's best aviator, commanded the NC-1, the type with...



neers. Towers commanded NC-3; LCdr. P. N. L. Bellinger, NC-1; and LCdr. Albert C. Read, NC-4.

Besides the technical problems of preparing three aircraft to top operating condition, the NC crews had to consider additional problems associated with transoceanic flying. These problems were: adequate fuel load to fly from Newfoundland to the Azores; weather conditions during the flight; navigating over open ocean to an island destination; communications; and facilities for survival and rescue if the aircraft were forced down at sea.

Finally all was ready. NC Seaplane Division One commanded by John Towers left Rockaway, N.Y., on May 8, 1919. Its destination was Halifax. From there it would proceed to Trepassey Bay, Newfoundland, to begin the long over-water leg to the Azores. Soon after takeoff, NC-4 developed engine trouble and had to make an emergency landing and taxi to the naval air station at Chatham, Mass., for engine repairs. Meanwhile, NC-1 and NC-3 went on to Halifax. With a new engine, the "lame duck" NC-4 headed north to catch up with the other two flying boats at Trepassey. When Cdr. Read and his crew reached Newfoundland, they found the other two aircraft taxiing across the bay for takeoff. Fortunately for the NC-4, the -1 and -3 were unable to get off the water: they had too much fuel aboard.

While the NC flying boats had been gathering at Trepassey Bay, other aviators had also arrived in Newfoundland. They were there to compete for the *Daily Mail* prize and like the NCs wanted to take advantage of the strong west-to-east winds to be first across the Atlantic. An Australian test pilot, Harry Hawker, and his British navigator, LCdr. Kenneth MacKenzie Grieve, were there with a Sopwith biplane with a 375-hp engine. F. P. Raynham and Capt. C. W. F. Morgan were also there. They had arrived in April with a Martinsyde airplane named *Raymor*. British Admiral Mark Kerr and his crew were preparing for the flight with a Handley Page V/1500, a four-engine bomber. A U.S. Navy airship, C-5, was also on hand for a transAtlantic try. And word had already reached the various flying teams that another pair of Englishmen, John Alcock and Arthur W. Brown, were en route to Newfound-

land with a Vickers *Vimy*, a converted World War I bomber, to attempt the crossing.

Nervously the flight crews studied the weather and watched each other's preparations. Drawing on its experience with McCurdy's flight of 1911, the Navy had stationed nearly 60 ships, most of them destroyers, at 50-mile intervals along the proposed route of the NCs. These ships would serve as navigational checkpoints, provide weather information, and stand by for emergency search and rescue should any of the flying boats be forced down en route to the Azores. The other transAtlantic competitors would fly, of course, without the aid of these station ships because their destination was Ireland or the British Isles, not the Azores.

On May 16th the weather was clear and the NCs prepared for an evening takeoff so that they would have daylight to find the Azores. They taxied across the bay, but only NC-4 could get off the water. The other two flying boats lightened their craft of all expendable equipment as well as one crewmember on NC-3 and the emergency radio designed to communicate with ships in the event of a forced landing. On the second try, all three took off successfully. With the string of destroyers to guide them during the night with flares, searchlights and occasional radio bearings, the NCs had little trouble with navigation until dawn on May 17. The daylight brought fog and a steady drizzle which obscured the destroyers and made visual navigation impossible. Realizing that they were lost, both NC-1 and NC-3 landed to establish their respective positions. NC-4, in contrast, continued on toward the Azores relying upon radio direction bearings from the destroyers in lieu of visual navigation. NC-1 had landed only slightly off the track to the Azores. Between station ships 17 and 18, NC-3 had gotten off course and was drifting south of the islands after it had landed. Although the crew members of NC-1 were afloat about 100 miles from the nearest port in the Azores, they were only on the water for five hours before a passing Greek freighter picked them up. All subsequent efforts to take NC-1 under tow failed, and the flying boat eventually sank.

NC-3 had a more difficult time. After a hard landing in heavy seas,

NC-3 was able to establish its position but unable to take off or to communicate its position to the searching destroyers because it no longer had its emergency radio. Consequently Cdr. Towers and his crew taxied and sailed stern first some 205 miles in 53 hours to the port of Ponta Delgada, their original destination in the Azores.

Meanwhile NC-4 had safely landed at the port of Horta at 11:23 a.m. local time. Read and his aircraft had flown 1,200 miles at an average speed of 74.8 knots. Handicapped by bad weather, NC-4 was unable to fly from Horta to Ponta Delgada until May 20. From there it flew on to Lisbon, Portugal, on May 27 and finally reached its ultimate destination of Plymouth, England, on May 31. At each stop,

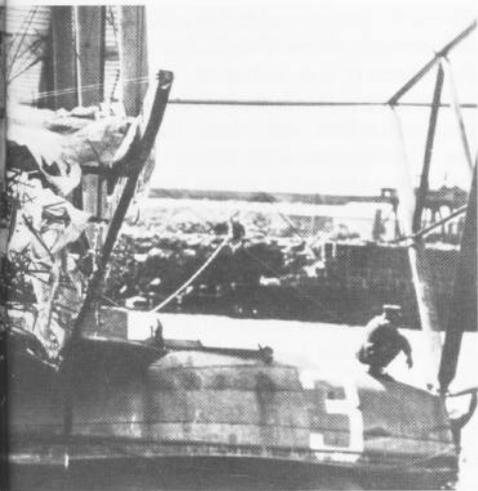


the crew of NC-4 received a hero's welcome.

NC-4 had been first across, even if the entire trip from New York to Plymouth had taken over 20 days. Although the experiences of the other two flying boats had been more dangerous and their rescues more dramatic, they failed where the NC-4 succeeded primarily because both NC-1 and NC-3 had been overly dependent upon the station vessels for navigation. When heavy fog had forced them to land to straighten out their navigation, they were unable to get airborne again. NC-4, in contrast, had relied on radio bearings for navigation in the fog and thus had been able to keep a better fix on its position. Clearly the flight of the NC flying boats showed that there was a great need to develop more accurate means for navigating over water, especially in bad weather, and to de-

velop a systematic method for accurate reporting of weather, before commercial flights across the Atlantic would be possible.

NC-4 had made it across first, but what of the others who were trying for the *Daily Mail's* prize? The Navy blimp C-5 was blown out to sea on May 15 before the NCs left Trepassey; so although no one was hurt in this accident, the blimp was out of the running. Hawker and Grieve took off on May 18, but about four hours out of Newfoundland, their engine overheated and they went down at sea. Fortunately a Danish freighter picked them up before their aircraft sank. For their efforts, they received a consolation prize of £5,000. Two hours after Hawker and Grieve took



off, the *Raymor* taxied across its airfield but while lifting off, a downwind yaw smashed the landing gear into the ground resulting in a crash in which the two men were unhurt. Adm. Kerr's bomber never did take off for Ireland because in the meantime Alcock and Brown had become the first to make a nonstop flight from Newfoundland to Ireland, thereby winning Lord Northcliffe's prize money.

Capt. John Alcock and Lt. Arthur W. Brown had both served in WW I, and both had begun thinking about a transAtlantic flight while serving as prisoners of war. Alcock was a pilot; Brown an air observer and artillery spotter. After the war, they went to work for the Vickers Aircraft Company where they learned of each other's plans. They convinced Vickers to let them use one of their twin-engine *Vimy* bombers which had been designed late in the war as a long-

range night bomber. They stripped the plane of all its military hardware, added additional fuel tanks and a radio. On May 4, 1919, the plane left in crates for Newfoundland. Alcock and Brown then arrived in Newfoundland in time to see the NCs and the other competitors for the *Daily Mail* prize take off.

Carefully the two British flyers re-assembled and tested their plane. Despite trouble with the radio they felt all was ready on June 14. That afternoon they taxied into a 40-mph wind and took off in good visibility. Soon the weather deteriorated into heavy fog. They had no way of checking their position over the Atlantic until about midnight when Brown was able to get a star sighting through a break in the fog. The next day was even worse. Snow and sleet brought icing problems. Six times Brown had to climb out of the cockpit to the engines and clean off the ice so that he could read the instruments and prevent the ice from choking the engines. About 5:00 a.m. on the 15th, navigator Brown got a look at the sun for a second navigational fix. He concluded from this position that they were approaching Ireland. Confident that they had sufficient gas to fly the remaining part of the trip, Alcock took the bomber down close to the sea where the warmer air and sun melted the ice. At 8:15 they sighted Ireland and headed in for a landing on what appeared to be a flat, even field. Their landing field turned out to be a peat bog near Clifden, Ireland, only 10 miles off their intended course. Upon landing, the nose of their plane tipped over in the soft turf. Fortunately there was no fire and neither pilot nor navigator was hurt. When the unbelieving local townsfolk refused to accept their story that they had just flown 1,890 miles in 16 hours and 20 minutes from Newfoundland, the resourceful airmen produced their padlocked Newfoundland mail pouch which was all the proof needed to convince their hosts of the truth of their story. For their efforts, the *Daily Mail* awarded Alcock and Brown £10,000 which they shared with their Vickers' mechanic. The King of England subsequently knighted both men in the festivities honoring their historic flight.

The NC flying boats had been first across but they had made the trip in

stages. Alcock and Brown had made the first nonstop west to east crossing. Yet the recounting of the bare facts of these flights fails to do them, or the flights of their competitors and successors, full justice. After the flight was over, John Alcock described it in grim terms: "It was pretty chancy. Once or twice, in fact, we thought our number was up." When Alcock made this statement, he was not exaggerating for the benefit of the newspaper reports. Indirectly, his comment reflected the rather primitive state of over-ocean flying in 1919.

Aerial navigation, whether over land or water, could give the flyer three types of information: where he was at that time; in what direction he ought to steer to get to his next desired position; and the estimated time when he would arrive at that position. Even before the Wright Brothers invented a practical flying machine, balloonists had been trying to solve the problems of aerial navigation. The aeronauts found they could use some of the techniques of marine navigation, such as the magnetic compass for heading and the barometer for altitude, supplemented by visual identification of landmarks. Dependence upon landmarks led logically to the development of aerial maps which showed key terrestrial features such as railroads, towns, rivers, mountains and so on. By 1914 some balloonists had even mastered the techniques of celestial navigation. Thus they could determine their position from the stars if they were unable to find clearly identifiable landmarks.

Airplanes and airships, far more than balloons, had to fly a particular heading; hence they quickly adapted the marine compass for aerial use. By 1914 aviators also had elementary instruments for measuring air speed and drift (the difference between the actual course flown due to wind and other factors and the intended course). Simultaneously, government authorities began to develop ground aids to navigation such as beacons, searchlights and ground signs. These beacons were essential for night flying.

Between 1914 and 1918 many aviators tried to improve or refine navigational techniques or instruments under the pressure of wartime flying conditions. As combat flights grew longer, pilots found they had to rely upon maps. Yet they had little time

to take their hands or eyes off the controls to study a map. Space in an open cockpit was at a premium. Two alternatives — improve the maps or add another crew member to navigate — were the immediate solutions to this problem. The necessity for a navigator was readily demonstrated in both the flight of NC-4 and of Alcock and Brown.

Yet these two flights of 1919 also showed how difficult over-ocean flying was, especially in poor weather. Aerial navigation improved only marginally in the 1920s. In describing the problems in navigation on his 1927 flight from New York to Paris, Charles Lindbergh wrote: "How does one navigate along a great circle, crossing 3,600 miles of earth and ocean? I've never made an over-water flight before. In fact, I've never really done any long-distance flying at all." Despite the availability of a bubble sextant since 1919, when LCdr. Richard E. Byrd, USN, among others, developed this tool for taking celestial observations by means of an artificial horizon, Lindbergh decided not to take one on his flight. His subsequent problems with navigation confirmed his belief that he could never have handled the sextant with one hand while he used the other to keep the plane steady. Lindbergh also decided that taking a radio would be of little use to him. He did not even use a drift indicator. All he would depend upon would be his compass, marine charts, turn indicator, air-speed instrument, and dead reckoning (distance traveled equals the product of speed and time flown). Fortunately Lindbergh's navigation by dead reckoning on the Newfoundland to Ireland leg of his flight was skillfully done and he arrived over Ireland not far from his intended position.

Nevertheless Lindbergh's rudimentary navigational methods were not always the norm. As the *Lone Eagle* was quick to point out, all he had to do was to hit the whole continent of Europe, not a group of islands such as the Azores. One example of the accuracy which was possible in aerial navigation for some pioneer over-ocean flyers is the flight of the Portuguese naval officer Gago Coutinho from the Cape Verde Islands to St. Paul's Rocks located on the equator some 600 miles northeast of Natal,

Brazil. Coutinho's navigational problem on this leg of his South Atlantic crossing was compounded by the small target he had to hit: St. Paul's Rocks covered an area of only 650 square yards with a maximum elevation of 30 feet.

In order to make sure he found St. Paul's Rocks and did not run out of fuel over the Atlantic, Coutinho designed and tested a type of bubble sextant in 1921. He became very proficient in its use. Thus, when he took off in a small, single-engined seaplane in April 1922, he was able to rely upon celestial navigation (which has a potential for greater accuracy than dead reckoning) to find St. Paul's Rocks 11 hours and 20 minutes after he departed the Cape Verde Islands. In its time, this was a truly remarkable feat of aerial navigation.

So much has been written about Charles A. Lindbergh and his nonstop flight from New York to Paris in 33½ hours that there is little need to recount more than the briefest details of the flight. Raymond Orteig, a French-born American who owned the Brevoort and Lafayette Hotels in New York City offered a \$25,000 prize for the first nonstop flight between New York and Paris. He offered the prize first in 1919 and subsequently renewed it because he felt the flight would foster good international relations between the United States and France. Between 1919 and 1927 there were few attempts at a transAtlantic flight to win the Orteig prize, but 1927 became the year for what Edward Jablonski calls "Atlantic fever." In addition to Lindbergh, no less than five other flying teams declared their intention of winning the prize. The Frenchman Rene

Fonck said he would fly the Atlantic in a Sikorsky biplane with three engines. But during one attempt to take off in September 1926, the plane had failed to become airborne and two of the four men on Fonck's plane died in the resulting crash and fire. Cdr. Byrd of the U.S. Navy was readying a Fokker trimotor monoplane, called *America*, for the flight. A New York millionaire, Charles Levine, had bought a Bellanca monoplane with a Wright Whirlwind J-5 engine which he was sure one of his pilots could fly to Paris. Lindbergh liked Levine's plane, *Columbia*, so much he tried to buy it for his own use on the flight, but he and Levine failed to agree on the terms of sale. Another competitor for the prize money was the team of LCdr. Noel Davis and Lt. Stanton Wooster. They would fly a Keystone biplane with three Wright Whirlwinds. This aircraft was called the *American Legion* after Davis' and Wooster's financial backers. And last, there were two Frenchmen who were sure they could win the prize flying from Paris to New York. These brave pilots were Charles Nungesser, a French ace in WW I, and François Coli, who was also a skilled pilot. Nungesser and Coli would fly a single-engine monoplane called the *L'Oiseau Blanc* (*White Bird*).

By the beginning of May 1927 the Ryan Aeronautical Company of San Diego, Calif., had finished the *Spirit of St. Louis* for Lindbergh, and he was making test flights in the plane. The other competitors were readying their aircraft. The first team to try the crossing in 1927 was that of Nungesser and Coli. They took off on May 8 and were never seen again. Davis and Wooster had already given



their lives in April 1927 for the cause of transoceanic flying when their plane had crashed in a Virginia swamp due to being overloaded. The mud and fumes suffocated both men. These two disasters left the Byrd team, the Chamberlin group and Lindbergh in the field.

The *Lone Eagle* arrived in New York from San Diego and St. Louis on May 12. There he waited at Curtiss Field for the weather to improve. Weather reporting and forecasting even in 1927 were hardly as accurate as they are today. As Lindbergh pointed out, the few weather stations that were set up then were designed to serve sailors and farmers — not pilots. Synoptic weather reports were primitive by present-day standards. And few merchant vessels bothered to radio in weather reports of conditions on the high seas. On the evening of the 19th, Lindbergh got word from the weather expert, Doc Kimball, that conditions over the Atlantic were probably going to improve the next day. With that information in hand, Lindbergh decided to go. He took off at 7:54 a.m. from Roosevelt Field on the 20th and, following the shortest route, flew north over Newfoundland before heading east to Paris. Thirty-three hours and 28 minutes later the *Spirit of St. Louis* landed at Le Bourget airport in Paris.

Lindbergh had flown a single-engine monoplane powered by a Wright Whirlwind J-5 engine. His reasons for choosing this type of aircraft were straightforward. It cost far less than a big trimotor plane. He judged that a multi-engine plane would be unable to get back to land if one engine failed so there was no need to use a trimotor. In addition, Lindbergh knew three engines would mean more fuel, making the plane even bigger and heavier than a single-engine plane. A flying boat, he knew, would be unable to take off with enough fuel for the crossing. Thus taking all the factors into consideration, Lindbergh decided on a single-engine plane. The *Spirit of St. Louis* was built by the Ryan Company in 60 days and cost only \$10,580.

The *Lone Eagle* shared the credit for the New York to Paris flight with his aircraft. Thus his account of the crossing which was published right after the flight was titled *We*. In his



later book, *The Spirit of St. Louis* (1953), he wrote that the airplane seemed "to form an extension of my own body, ready to follow my wish as the hand follows the mind's desire — instinctively without commanding." At the end of the flight, Lindbergh wrote: "We have made this flight across the ocean, not I or it."

In Lindbergh's praise for the *Spirit of St. Louis* there was a clear expression of the image of Bellerophon and Pegasus, the horseman and his steed, flying in the service of sea-air aviation. Lindbergh's flight had been no easy triumph. He had to battle sleepiness, bad weather that brought icing to his aircraft's wings, difficult navigation, and the constant worry of engine failure. Yet he and his aircraft had slain all these monsters of transoceanic flight.

Although Lindbergh received the greatest public acclaim of any trans-Atlantic flyer, his solo flight from New York to Paris was not the only historic transoceanic flight. Others also helped to advance the state of sea-air aviation in the 1920s and 30s. Lindbergh's rivals, for example, made notable long-distance over-ocean flights. Charles A. Levine, owner of the single-engine *Columbia* monoplane that Lindbergh had wanted to buy, flew with pilot Clarence Chamberlin from New York to Bishoforode, Germany, a distance of about 3,905 miles, in just under 45 hours. Chamberlin and Levine had wanted to fly to Berlin, but when they arrived over Europe, they were unable to determine their position accurately. Eventually they ran out of gas and landed, on June 5, 1927, in a pasture 110 miles from the German capital.

Later in June, Cdr. Byrd and his crew of four took off for Europe in the trimotor *America*. Byrd knew, of course, that Lindbergh and Chamberlin and Levine had made the sensational flights, but he conceived of the flight of the *America* as the prototype for future commercial aviation service between the United States and Europe. *America* was about three times the size of either the *Spirit of St. Louis* or *Columbia* and weighed about 15,000 pounds. It was fitted out with radio and the latest navigational instruments. Thus it was well-designed for testing the possibilities for future commercial transport.

America left New York at dawn on June 29th. All the way across the Atlantic the plane encountered rain and fog, which hampered accurate calculation of its position. Although their destination was Paris, Byrd and his crew were not able to find the French capital in the 75-foot ceiling on the night of June 30. Finally when their gas got low, they landed the plane safely on the ocean not far from Caen.

After these flights of June 1927, aviators turned their attention to conquest of the North Atlantic from east to west. This was the more difficult flight because the pilot and aircraft would be battling the prevailing west-to-east winds during the entire flight. These winds would seriously reduce the speed of any aircraft, thereby requiring the plane to carry a greater fuel load. The first nonstop east-to-west crossing of the North Atlantic was on April 12-13, 1928. Two Germans, Herman Köhl and Baron von Huenefeld, and an Irishman, James Fitzmaurice, flew the *Bremen*, a single-engine, low-wing monoplane of all-metal construction, built by Junkers, from Baldonnel, Ireland, to Greenly Island, Labrador. These flyers had hoped to reach New York but ice, wind squalls and snow used up their fuel, forcing them to land on the ice and snow of Labrador after 36½ hours in the air. Two years later, in September 1930, Dieudonné Costes and Maurice Bellonte duplicated Lindbergh's flight in reverse. They flew a single-engine aircraft, the *Point d'Interrogation* (*Question Mark*), from Paris to New York, arriving before a crowd which included the *Lone Eagle*.

To be continued